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PRANOTO MONGSO AS AGRICULTURAL CALENDAR, A JAVANESE CULTURAL HERITAGE IN THE MIDDLE OF GLOBAL CLIMATE CHANGE

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ABSTRACT

Pranoto mongso (from Javanese, *pranåtåmångså*, literally "the conditions of seasons") is a type of agricultural calendar particularly for the purpose of farming and fishing. It is a local wisdom created by the famous poet R.Ng.Ronggowarsito to introduce time and has been practiced by the people in Java Island for thousands of years. This knowledge is presumably inherited from generation to generation from the period of Medang or Mataram Kingdom (Hinduism) in the 9th century to the period of Mataram Sultanate in the17th century as a reference in the fields of agriculture economy, administration, and defense(military). *Pranoto mongso* has been officially used by Sri Susuhunan Pakoeboewono VII, the King of Surakarta, since June 22, 1856. It is based on solar rotation, which is similar to the Gregorian calendar. The application of *pranoto mongso* in the middle of climate change remains relevant as a general guideline for anticipation. For instance, *Mangsa Rendeng* (December-February) is the months of storms, rains, floods, and landslides, while *Kawolu* (February-March) informs farmers to be prepared for plant diseases and plagues that affect humans and animals. *Pranoto mongso* is still limited to once-a-year rice farming. In order to anticipate climate change, *pranoto mongso*,as a global seasonal approach, has to be corrected using the updates and applications of climate prediction as well as the development of site-specific (or regional), dynamic cropping pattern and calendar. Water-efficient crop varieties and cultivation patterns are highly applicable for dealing with climate change. Pranoto Mongso is preserved by the Javanese people, especially in Central Java Province, as global season guidelines.

Keywords: Pranoto mongso, agriculture, Javanese, climate change.

A. INTRODUCTION

Pranoto mongso (from Javanese, *pranåtåmångså*, literally "the conditions of seasons") is a type of agricultural calendar particularly for the purpose of farming and fishing. It is a Javanese calendar developed from the life experience of the people for years. Therefore, it can be useful for human beings and for any purposes. According to Wiriadiwangsa (2005), our ancestors had known and memorized the patterns of seasons, climates, and other natural phenomena for thousands of years before they were able to create an "annual calendar". This calendar is not based on the Shamsi Calendar (Anno Domini) nor Qomariyah (Hijri/Islamic) Calendar, but on natural phenomena such as rainy seasons, droughts (dry seasons), flowering seasons, the location of stars in the universe, the influence of full moon on seawater tides, etc.

Pranoto mongso was initially a local wisdom created by the well-known poet R.Ng.Ronggowarsito to introduce time and has been practiced by the people in Java Island for thousands of years. It is based on solar rotation, which is similar to the Gregorian calendar. The year of 1582 is the first year in the Gregorian calendar. The most important things of the calendar are that the length of the year is 365days and 6 hours, the sun is right above the equator on March 21, and the leap years only occur in years that are divisible by 400 not in every fourth year (Patsuwiryo,2015). Due to the relations between *Pranoto mongso* and the Gregorian calendar, similarities are found between the two, i.e. the former consists of 12 months and each month is between 23-43 days. *Pranoto mongso* has been officially used by Sri Susuhunan Pakoeboewono VII, the King of Surakarta, since June 22, 1856. This particularly date starts the first day, the first mangsa (season), and the first year of *pranotomongso*. Daldjoeni (1984) explained that it has existed since the age of old agricultural kingdoms in Central Java, such as Old-Mataram, Pajang, and Islamic Mataram. The people in Java Island, particularly those who reside in Mt.Merapi, Merbabu, and Lawu, have known the principles of *pranotomongso* far before the introduction of Indian influence. The population of area swith climate Am (Koeppenclimate classification) applies dating that is based on solar rotation and constellation. This reference is part of their harmonious lives in which they follow the changes in natural rhythms within one year. The determination of *pranoto mongso* is actually unknown because it has been mentioned in Centini, which was developed in 1820-1833 during the governance of Paku Buwono V. The knowledge introduced in *pranoto mongso* is presumably inherited from generation to generation, from the period of Medang or Mataram Kingdom (Hinduism) in the 9th century to the period of Mataram Sultanate in the 17th century as a reference in the fields of agriculture, economy, administration, and defense (military).

B. METHOD

This study aims to explain the meaning and existence of the pranoto mongso tradition as the farmers' planting season calendar. The study was conducted using a qualitative approach with the type of phenomenology study. The determination of informants was chosen using the snowball sampling technique. Data collection is mainly carried out through in-depth interviews and supported by observation and documentation activities. The phenomenological research data analysis technique is carried out by using several stages, including Epoche, Phenomenology Reduction, Imagination Variation, Textural Descriptions and Structural Descriptions, Meaning and Object Essence.

C. RESULT AND DISCUSSION

1. *PRANOTO MONGSO*, A JAVANESE CULTURAL HERITAGE

Pranoto mongso has a cosmographic background ("the measurement of the positions of celestial objects"), i.e. the knowledge mastered by the Austronesians as a guideline in marine navigation and various cultural ritual activities. Because the annual sun rotation causes seasonal changes, *pranoto mongso* there by owns a number of climatic identifiers. The Orion constellation ("*Waluku*", the plow star) is an important guide in *pranoto mongso*. Ammarell (1998 in Hidayat, 2012) named the calendar used by almost all people in the Indonesian Archipelago today with the "Sky Calender", which is based on the configuration of "Waluku" (the plow, innative terminology; Orion in Astronomy) as the main identifier of time. Therefore, the Orion year is the synonym of agricultural year.

Pranoto mongso can also be regarded as an Orionic Calendar, or a calendar that uses constellations in its development, because Orion, which agrarian people regard as *(Wa)luku* or plow, has a significant presence and role for the people. In the past, farmers put grains of rice onto their open hands and directed their hands towards Luku in the evening. The right time to start farming was when the grains fell from their hands. This calendar has been applied since before the history of Indonesia was recorded. The reference of the calendar is not only celestial objects but also natural phenomena, such as planting seasons, animal behaviors, wind directions, humidity, and rainfalls. The calendar is used as a guideline in agriculture, trade, migration, war, and governance.

Pranoto mongso is based on solar rotation whose cycle is 365 (or366) days. It contains various aspects of phenology and other natural phenomena that are utilized as a guideline in farming practices or disaster preparedness (e.g.against drought, disease outbreak, insectpest, and flood that may occur at certain times). It is highly suitable for areas around Mt. Merapi and Mt. Merbabu, Central Java, where the wet and dry seasons have the same length. The bio-climatological view of each season provides information on the behavioral patterns of crops, animals, and humans as well as information on a bioticnatural resources, all of which enable farmers to forecast the seasons (Daldjoeni,1984).

A side from the application in agricultural practices, *pranoto mongso* is also applicable for fishing. It is widely used by anglers to catch fish in the Indian Ocean on the south of Java Island. Many anglers use it as it is proven able to increase fish production. The fish production per year per ship in this part of the ocean is higher, and provides higher income, when it uses *pranoto mongso* (Tapari, 2015).

Pranoto mongso harmonizes the relationship between humans and their nature because human beings are an important part of ecosystem that should understand the condition of the nature and how top reserve it. It trains the sense and sensitivity of farmers to observe, feel, and read the nature. Consequently, the harvest of various commodities cultivated by farmers at that time can be more consistent and provide them with satisfactory results.

The people in Central Javae specially believe and know *pranoto mongso* as a base for determining the time to start planting. The people in Java and Bali call it as *pranata mangsa* (Sundanese), *pranoto mongso* (Javanese), and *kerta masa* (Balinese). In the past, *pranoto mongso* was required to determine the correct time for starting anya ctivities, e.g. farming activities, fishing activities, migration, and war. Therefore, people could reduce risks and prevent high production costs (Wiriadiwangsa,2005).

Pranoto mongso has four seasons (or mangsa), namely: (1) *Mangsa labuhan* starts at the beginning of rainy season in the end of September or October (in this season, farmers start to plant *polowijo*); (2) In *Mangsa rendengan* (October - November), rain falls intensively and farmers start to plant rice or transplant it to the field; (3) In *Mangsa marengan* (March), rain falls decrease, the *polowijo* planted in Mangsa labuhan is harvested, and farmers start to plant in *tegalan* (dry cultivation land) again; and (4) *Mangsa kemarau* (April-May) is the season where farmers can start to harvest the rice they cultivate in *Mangsa rendengan* and, then, plant *polowijo* or rice (when water is available) or *padi gadu* (rice planted in limited water availability) (Daldjoeni,1997 in Tapari, 2015).

Pranoto mongso is the calculation of seasons that centers at phenology or the behavior of animals and plants. It is a based on solar system; therefore, it is comparable with the growing seasons

that farmers refer to nowadays. According to *pranoto mongso,* one year is divided into 12 seasons from Kasato Sada (presented in Table 1).

The application of *pranoto mongso* in the middle of climate change remains relevant as a general guideline for anticipation. For instance, Mangsa Rendeng (December-February) is the months of storms, rains, floods, and land slides, while Kawolu (February-March) informs farmers to be prepared for plant diseases, plagues that affect humans and animals, and the impact of floods, storms, and land slides that likely disperses diseases, hunger, etc.(Wiriadiwangsa,2015).

Table 1. *Pranoto mongso* and the natural identifiers of crop growth.

No.	***Mangsa*** **(Seasons)**	**Main Seasons**	**Lengths of Seasons**	***Candra*** **(Metaphorica characteristics)**	**Natural Identifier**	**Guidelines (for farmers)**
1	*Kasa (Kartika, kahiji)*	*The third - Light*	June 22 – August 1 (41 days)	*Sesotya murcå ing embanan ("Diamond is falling from its box" means that leaves are falling)*	Leaves fall, woods dry, and grasshoppers enterthe ground.	Farmers burn rice straws in the field; they start to plant polowijo.
2	*Karo (Pusa, Kadua)*	*The third-Famine*	August 2-24 (23 days)	*Bantålå rengkå* ("Earth breaks" means that the surface of the ground cracks)	Soil dries and cracks, kapok and mango trees beginto bloom.	*Polowijo* starts togrow, kapok and mango trees begin to bloom, and soil startsto crack.
3	*Katelu (Mang-gasri, Katilu)*	The third-*Semplah*	August 18-Sept 25 (24 days)	*Sutå manut ing båpå* ("Children obey their fathers")	Crops are climbingup the lane, bamboo shoots are emerging.	No crops in the field because of the heat; Polowijo is harvested, and various types of bamboo grow.
4	*Kapat (Sitra, Ka -opat)*	*Labuh-Semplah*	Sept 19-Oct 13 (25 days)	*Waspå kumembeng jroning kalbu ("Tears flood the heart" means that many springs are dried up)*	Wells are dry, kapok trees begin to bear fruits, small birds start nesting and laying eggs.	*Polowijo* is harvested, fields are not or rarely planted because of dry weather. Farmers cultivate their lands for dry rice and banana.
5	*Kalima (Manggak ala, Kalima)*	*Labuh-Semplah*	Oct 14- Nov 9 (27 days)	*Pancuranmas sumawuring Jagad* ("Golden Shower waters the world" means that rain starts to fall)	Heavy rain starts to fall,the young Leaves of Javanese tamarind tree starts to emerge, caterpillars begin to appear, flying ants are out of the	Field trenches are fixed,allowing water to flow at the edge of the rice fields. Farmers start to transplant dry rice to the fields.

					burrows. Bitter ginger, turmeric, and finger root begin to sprout.	
6	*Kanem (Naya, Kagenep)*	*Labuh Udan*	*Nov 10 –Dec 22 (43 days)*	*Råså mulyå Kasuciyan* (fruit trees start to bear fruits)	Fruits (durian, rambutan, mangosteen, and others) appear. Grouse start to appear in watery places.	Farmers spread rice Seeds in the nursery and begin to cultivate their lands.
7	*Kapitu (Palguna, Katujuh)*	*Rendheng-Udan*	*Dec 23– Feb 3 (43days*	*Wiså kénter ing Marutå* ("Poison Drifts with the wind" Means many diseases)	Many rains fall, Many rivers overflow. Flood, storm, and landslide season.	Farmers start to Transplant rice seeds To the fields/start to Plant in the fields.
8	*Kawolu (Wisaka, Kadala-pan)*	*Rendhen-Pangare-arep*	*Feb 4-28/29 (26/27 days)*	*Anjrah jroning Kayun* ("The expression of heart" means the breeding season of cat and other animals)	The breeding season of cat; rice becomes green; white grub larvae starts to emerge.	Rice becomes green
9	*Kasanga (Jita,Ka-sembilan)*	*Rendheng –Pangarep -arep*	*March 1-25 (25 days)*	*Wedharing wacånå mulyå* ("The emergence of noble voices" means mating calls of some animals that attract the opposite sex, e.g. cicada)	Rice is flowering; crickets start to appear; cicadas vocalize their mating calls; floods may still occur; the flowers of wild sugar cane fall.	Rice is flowering, and the grains start to appear
10	*Kasepuluh (Srawana, Kasapu-luh)*	*Marèng– Pangarep-arep*	*March 26 -April 18 (24 days)*	*Gedhong mineb jroning kalbu* ("Buildings are caught in hearts" means that many animal sare pregnant)	Rice is yellowing, many animal sare pregnant, small birds start to hatch their eggs.	The rice grain sare filled. The color varies between green and yellow. Some of the rice field sare harvested.
11	*Desta (Padrawa-*	*Marèng–* Harvest	*April 19– May 11*	*Sesotyå sinåråwèdi* ("The glorious diamond"	Birds feed their chicks; kapok trees shed cottons.	After the harvest of short-lived crops, there is still time for

	na, Kasabe-las).		*(23 days)*	means that the birds' eggs are hatching and the mothers start to feed their chicks)		planting *polowijo*.
12	*Sada* *(Asuji, Kadua-belas)*	*Marèng*– Light	*May 12*– *June 21* *(41 days*	*Tirtå sah saking sasånå* ("Water leaves its house" means that farmers rarely sweat because of cold and dry air).	Air temperature decreases. The environment feels cold (*bediding*)	Farmers start to dry their rice under the sun, put it in to the granary. Only rice straws remain in the field. It is time to plant *polowijo* (soybean, indigofera, cotton wood trees) and corns.

Notes: One-season rice cropping system
Source: Modified from Pratosuwiryo (2015) and Sabdadewi (2014)

During Mangsa Mareng (March-April-May-June), rains start to decrease, farmers harvest and dry their rice, only rice straws remain in the fields, many animals are pregnant, and small birds begin to lay their eggs. Such conditions are close to the situation of the first dry season (MK-I). Meanwhile, in Mangsa Ketiga (the end of June-July-Augustus-September), some farmers grow polowijo (e.g., cassava, corn, beans, soybeans, etc.), soils begin to crack, some parts of the lands are not farmable because of the heat. In this situation, lands (especially rainfed lands) are left untouched/unplanted (bero). The next season, Mangsa Labuh (from September until early November), is usually the beginning of transition seasons (changes in the seasons).

In Java Island, each year has three growing seasons (MT). Growing season is when farmers start to cultivate their lands for nurseries until the end of the planting period. These three seasons are namely: (a) Rainy Season (November-February); (b) Dry Season I (March-June, and (c) Dry Season II (June-October) (Tapari, 2015).

Pranoto Mongso a cosmographic background ("the measurement of the positions of celestial objects"), i.e., the knowledge mastered by the Austronesians as a guide in marine navigation and various cultural ritual activities. Because the annual sun rotation causes seasonal changes, pranoto mongso there by owns a number of climatic identifiers.

Pranoto Mongso is a simple farming calendar that is highly applicable in dry lands, rainfed fields, and semi-technical irrigated fields. Weather and climate elements such as solar radiation, temperature, air humidity, wind speed, and rainfall are highlighted in pranoto mongso in this calendar, each type of crop and animal is farmed and raised in a regular cycle that leads to environment conservation (Tapari, 2015).

Wisnubroto (1995) analyzed Pranoto Mongso from meteorological point of view by exploring the nature of the atmosphere. This study acts as a scientific reason behind the efficient use of Pranoto Mongso as a guideline. From its meteorological consideration, Pranoto Mongso is proven to some extent that it can be utilized as a guideline in various activities especially those related to agricultural practices. It is a traditional calendar with similarities to the Gregorian calendar. Thereby, people can

use it despite the ubiquitous misapplication. The misuse of Pranoto Mongso is mainly because the use of constellation as a reference. Constellation shifts and requires 4 minutes longer to return to its original position. Pranoto Mongso is preserved by the Javanese people, especially in Central Java Province, as a global season guideline.

2. *PRANOTO MONGSO* IN THE MIDDLE OF GLOBAL CLIMATE CHANGE

Recently, climate change has been the center of attention worldwide. Its impact is mostly felt by farmers. Harvest failure (puso) is mainly caused by uncertainties in seasons or flood occurrences. Flash flood that devastated various regions lately did not rule out the possibility of extreme climate change impact. Climate change is indicated by an increase in temperature and rainfall intensity. A heavy rain that falls at an intensity of 240 mm/days for a long duration likely results in floods and landslides, which damage people's belongings and cause fatalities. Tens of thousands of hectares of agricultural lands, both rice fields and dry lands, experience harvest failure due to flash floods in various regions in Java Island; hence, the impact is mostly felt by farmers. Aside from floods, farmers are haunted by prolonged drought in dry season and uncertainty in growing season (Suntoro, 2006). Farmers strongly rely on seasons. Therefore, a shift in the growing seasons affect the outputs of their farming activities. Considering this condition, the settled Pranoto Mongso that has been used as a guideline by farmers in Java Island since a long time ago seems to require correction.

Global climate change is mainly caused by human activities in addition to natural events. The atmosphere system and human activities interact and, thereby, interrelate. Deforestation, industrial activities, and transporation highly control the quality of the atmosphere system by changing its gas composition. Atmosphere is a layer consisting of many types of gases that surround the Earth and controls the Earth's climate. Therefore, a change in gas composition likely affect the climate.

In the last three decades, the climate in Indonesia has experienced a rather dynamic change. This change includes a rise in air temperature and an increasingly diverse climate pattern. A high air temperature causes an increase in evaporation and evapotranspiration, leading to the depletion of water availability and prolonged drought. The pattern and distribution of rainfall follow a certain trend, i.e., dry regions become drier (drought), while wet regions become more wet (flood and inundation). Consequently, water sustainability is disrupted. Climate change is also indicated by the unbalanced amount of water in dry and wet seasons. In other words, people in several areas in Java Island experience water shortages during dry seasons and floods during rainy seasons, all of which cause harvest failure.

Nowadays, Pranoto Mongso is being abandoned by young generations of farmers. One of the reasons is the primordial factor in Javanese farming culture. The impact of global climate change includes a shift in the seasons. Such condition makes the season becomes erratic and deviate the natural system, i.e., rains during dry seasons or absence of rains during rainy seasons. The shift of meteorological seasons become the obstacles for farmers to understand the nature. Therefore, pranoto mongso seems to require correction in terms of global climate change. The beginning of rainy season has been recently hard to predict. Dry seasons tend to last longer, while the rainfall pattern and distribution become uncertain. Consequently, farming practices that strongly depend on seasons become vulnerable of seasonal change. Therefore, the global approach used to determine the growing seasons or patterns has to be site-specific. Accordingly, the availability of accurate data, supported by

rainfall (climate) monitoring in various locations, becomes necessary for more accurate season prediction and for the prevention of seasonal disturbance. Government should participate intensively in coping with climate change, especially in facilitating the distribution of climate and weather information and the introduction of site-specific, dynamic cropping pattern (Suntoro, 2008).

Aside from drought and flood, climate change causes the emergence of new, unpredicted pests and plant diseases. Farmers need to anticipate the possibility of these diseases reducing agricultural production by implementing adaptation measures against the negative impact of climate change. Without adaptation, climate change will result in greater losses. The Ministry of Agriculture has provided various facilities and farming technology that can be utilized by farmers to adapt with climate change. However, farmers do not just directly apply such facilities and technology. The mostly applied adaptation measures include the adjustment of cropping pattern, the beginning of growing season, and the selection of crop varieties (Sugiharjo, 2017).

Wisnubroto (1995) reveals that Pranoto Mongso in Boyolali, Central Java Province is widely used by especially old farmers but rarely understood by the young farmers. The parent generations have significant role in preserving it. The seasons in Pranoto Mongso have similarities to meteorological elements and, thereby, can be used as a guideline in agricultural activities. Each of its seasons is divided thoroughly. Retnowita et al. (2014) explains that the population of Gunung kidul, the Special Region of Yogyakarta who resides in the karstic area is very wise with water resource management. Pranoto mongso is a seasonal calendar that teaches people to develop a harmonious relationship with their environment. The rural people in Gunungkidul, especially the old farmers, are still familiar with Pranoto Mongso and still apply it for their farm-based activities. However, due to climate change, both the old and young generations of farmers question the effectiveness of Pranoto Mongso, . Nevertheless, they still appreciate it as their cultural identity.

Pranoto mongso actually includes a period of change that aims to anticipate extreme climate. The recent climatic condition is unpredictable due to the changes in extreme climatic events (i.e., El Nino and La Nina). In other words, the beginning of rainy season is also unpredictable. However, our ancestors wisely faced the predictions for the beginnings of rainy and dry seasons using Mangsa Labuh. This mangsa is a dry season with several occurrences of rainfalls and is indicated by farmers starting to plant dry rice on their lands and spread rice seeds on the nursery (in Javanese, “methuk”) These indicators are apparently similar to today’s pancaroba i.e., a transition from dry into rainy seasons. Kristoko et al. (2012) developed pranoto Mongso using fuzzy logic for data classification process. From their research in Boyolali, Central Java Province, they found that pranoto mongso was still relevant for determining the change in cropping pattern and calendar as well as for selecting the cultivated commodities.

In response to the uncertain climate, Climate Field School (Sekolah Lapang Iklim-SLI) is being developed to improve the ability of farmers to understand various aspects of weather forecast and its relations to their farming practices. In other words, the school aims to teach farmers so they can “translate” information on weather forecast and combine it with local wisdom. In this school, pranoto mongso becomes the reference for various natural events that are predicted to emerge as a response to weather condition or climate change. As a conclusion, it is still reliable for monitoring natural phenomena. The ability to read natural phenomena is important for farmers as they have to adapt efficiently to any changes in cropping pattern.

Various strategies are applicable for anticipating climate change, namely: (a) updating and utilizing climate prediction; (b) developing dynamic cropping pattern and calendar; (c) creating and using drought- and flood-resistant, short-lived variety; (d) harvesting water and using it efficiently by building retention basins (small dams) in rain catchment area; and (e) adopting dry seedling technology (Subagiono, 2007). In addition, water-efficient irrigation system is developed through the application of System of Rice Intensification (SRI) as well as the development of rice variety for dry land.

Pranoto mongso remains relevant for determining the seasons in general, but its application for rice farming in the middle of season change requires certain additional cultivation strategy. The strategies for areas with late onset of rainy season and below normal rainfall include: (a) the use of drought-resistant, short-lived (or genjah, i.e. less than 100 days) variety that is also resistant to pests and major diseases; (b) minimum or no tillage technology to shorten the growing period; (c) the implementation of cropping based on the schedule for water classification. Meanwhile, areas with late onset of rainy season and normal amount of rainfall can use the following strategies: (a) applying minimum tillage and (b) cultivating short- lived variety. These strategies aim to use the remaining cultivation season for maximizing the first growing period and for cultivating crops based on the schedule for water classification. As for areas with normal rainy season but with below normal rainfall, farmers can cultivate drought-resistant, short-lived crop variety using water- efficient irrigation technique (Subagiono, 2007).

In terms of updating and utilizing climate predictions as well as developing a dynamic cropping pattern and calendar, the Agency of Agricultural Research and Development (Balitbang Pertanian, 2012) has issued an Integrated Crop Calendar (Kalender Tanam Terpadu-KATAM) for every regency. This calendar is expected to assist farmers in identifying the best time to start farming. It also provides farmers with recommendations of appropriate varieties and fertilizers. The calendar was developed based on actual and potential conditions. The actual condition includes the extent of cultivation area as well as the intensity of cultivation, while the potential condition is deduced from rainfall-based water availability analysis (climatological analysis).

Soil and water conservation in watershed becomes necessary in anticipating climate change. The conservation prevents destruction on vegetation (land use conversion) and, at the same time, involves reforestation. Reforestation is conducted inside and outside of the forest areas. The cropping system may include two patterns, namely woody plants (with one or mixed type of woody plants) and agroforestry. Agroforestry is an intercropping pattern that combines annual crops with agricultural crops. It can cover soil perfectly, creating effective soil and water conservation. At the same time, multiple cropping is also suitable for soil and water conservation. This system plants more than one type of crops in the same plot of land together (intercropping) or rotationally. If one crop is failed, farmers can rely on another. Therefore, multiple cropping system can anticipate harvest failure induced by deviations in the seasons. Another advantage of this system is that it can reduce soil erosion and improve the water system in the farms. It increases the supply of infiltration water, i.e., the water used and saved for plant growth; hence, it is resistant to drought.

D. CONCLUSION

The use of Pranoto mongso in the middle of global climate change remains relevant as a general guideline for anticipation. For instance, Mangsa Rendeng (December-January February) is the months of storms, rains, floods, and landslides, while Kawolu (February-March) informs farmers to be prepared for plant diseases, plagues that affect humans and animals, and the impact of floods, storms, and landslides that likely disperses diseases, hunger, etc.

In order to anticipate climate change, pranoto mongso as a global seasonal approach, has to be corrected using the updates and applications of climate prediction as well as the development of site-specific, dynamic cropping pattern and calendar. Water-efficient cropping system has to be implemented especially for rice cultivation. Multiple cropping system is highly suitable for soil and water conservation. It can anticipate harvest failure induced by seasonal disturbances because farmers can rely on other crops if one crop experiences harvest failure.

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